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STUDY PLAN

A BHC-ATTRACTANT SPRAY FOR DRAWING THE BLACK TURPENTINE BEETLE TO STUMPS

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The Problem

Infestations of the black turpentine beetle, Dendroctonus terebrans (Oliv.), commonly are associated with partial cutting of timber on bottomland sites. The beetles apparently are attracted to freshly cut stumps and slash, and to the bark and roots of residual trees that have been damaged by logging machinery.

Typically, the insects first invade stumps, and the broods that develop there later spread to standing timber. When stand disturbance is severe, however, trees and stumps may be attacked at the same time, or the beetles may even prefer weakened residuals to stumps.

Preventive or remedial control is usually accomplished by spraying stumps and skinned portions of trees with a benzene hexachloride (BHC)-diesel oil solution. But, when additional trees become infested after such a treatment, control crews must return to the area at a considerable added expense.

If a BHC-attractant formulation applied to stumps will draw beetles away from living trees, control procedures will be more certain, and costs will be substantially reduced.

Past and Current Work

Several researchers have demonstrated that certain scolytids are attracted to turpentine, or its components, but only empirical observations have been made on the attractiveness of turpentine to the black turpentine beetle.

Chararas (1) and Chararas and Berton (2) found that some species of Ips, Pityogenes, Cryphalus, and Dryocoetes show a definite response to a 0.1 to 2.0 percent concentration of alpha-pinene, beta-pinene, or terpinsol in oil of turpentine. However, optimum attraction is exerted within a very narrow range of concentrations, and varies according to the species. Yasunaga (4) also showed turpentine to be attractive to scolytids, particularly when a small quantity of benzoic acid is added to it. Xyleborus, Cryphalus, Myelophilus, and Pityophthorus species evidently prefer this attractant combination to trees that are highly susceptible to attack.

Attraction of the turpentine beetle to turpentine was reported by Hopkins (3) in West Virginia, where he observed great numbers of the insects swarming into furniture factories and freshly painted buildings or "wherever there was an odor of turpentine."

In a recent exploratory study,[1/] Bennett found that naval stores trees sprayed with turpentine were more attractive to the turpentine beetle than were untreated trees in the vicinity. He pointed to the need for further studies in logging areas where a BHC-turpentine solution applied to stumps might attract and kill beetles, thus reducing the number of attacks on living trees.

1/ Bennett, Wm. H., 1962. Study plan: Chemical control of the black turpentine beetle, Dendroctonus terebrans (Oliv.) in naval stores timber. U.S.D.A. Forest Service, Southern For. Ext. Station.

Scope and Objectives

Study plots will be established in recently cutover stands on the Kisatchie National Forest, Louisiana. There will be 2 successive stages, with the following objectives, respectively:

1. To determine the relative potency of different concentrations of attractants in diesel oil.
2. To discover if stumps sprayed with a BHC-diesel oil solution plus an appropriate attractant will draw the turpentine beetle away from damaged trees.

Methods

In each stage of the study, plots will be located on poorly drained soils where beetles are expected to become active. As soon as logging has been completed, uninfested stumps will be selected for treatment and as checks.

Spray will be applied with a garden-type sprayer to the entire bark surface from the top of the stump to the root collar. The bark and bark crevices will be thoroughly covered to the point of runoff or, roughly, at the rate of 1 gallon of spray to 50 square feet of bark surface.

If remedial control becomes necessary inside or outside of the plots, it will be delayed for as long as possible following plot treatment and in accordance with Forest Service recommendations.

The study will be undertaken as follows:

Stage 1. To ascertain the relative attractiveness of different concentrations of attractants to the turpentine beetle.

(Study to be started about June 1, 1963.)

Four blocks, with 5 replications (single stump plots) of each treatment randomized within each block, will be selected on areas that are as uniform as possible with respect to time and method of cutting, site (including soil condition), and stand structure. Since it is not known if the beetle can discriminate between different attractants applied to stumps that are close together, treatment stumps will be at least 50 feet apart. Treatments will be as follows:

Treatment 1. With 50-percent pure spirits of turpentine in diesel oil.

Treatment 2. With 10-percent pure spirits of turpentine in diesel oil.

Treatment 3. With 10-percent pure spirits of turpentine plus benzoic acid (in the proportion of 1 part to 100 parts of turpentine by weight) in diesel oil.

Treatment 4. With 10-percent alpha-pinene in diesel oil.

Treatment 5. With diesel oil, to serve as a check.

Treatment 6 — Unsprayed as check

Stumps in the 5 treatments will be marked on the top surface with orange paint, using the figures 1 to 5, respectively.

If the attractants prove to be effective, attacks probably will first occur on ~~sprayed~~ treatment stumps, but eventually all stumps may become heavily or equally populated. Therefore, plots will be

examined weekly until they are no longer subject to attack. At each inspection, the number of visible beetle attacks on each stump and the total for each plot series will be recorded. At the last inspection, stumps will be debarked so that a more accurate count of the total number of attacks can be made. From these data a final analysis will be made to determine the effectiveness of the different treatments. Whether the analysis will be based upon total infestation through the time at which observations are ended or upon the periodic cumulative attacks, will depend upon beetle behavior.

Stage 2. To test the value of a BHC-attractant spray in drawing the turpentine beetle to stumps and away from living trees.

This stage will be started about July 15, 1963, and will be contingent upon the results of Stage 1.

Two blocks with 20 replications, or plots of each treatment randomized within each block, will be selected as in Stage 1. Plots within each block will consist of 1 damaged but unsprayed tree and 10 adjacent sprayed stumps. The blocks will be separated by a distance of at least 10 chains, and treatments will be as follows:

Treatment 1. Stumps will be sprayed with a 0.5 percent BHC-attractant solution (based upon the most promising formulation developed in the previous stage of the study.)

Treatment 2. Stumps will be sprayed with a 0.5 percent BHC-diesel oil solution, to serve as a check.

Stumps in the test and check plots will be marked with an X and 0, respectively. The damaged residuals to be sampled in the

test and check plots, will be marked with an orange and white flagging, respectively.

The marked residuals will be examined monthly until they are no longer subject to beetle attack. At the final inspection, the total number of beetle attacks for each treatment will be recorded, and the effectiveness of the attractant determined by statistical analysis.

Personnel Assignment

Bennett will be responsible for preparation of plans, reports, and compilation of data, and, with the aid of a summer student, will establish plots, conduct tests, make observations, and record results. The proper procedure for analyzing the data may require assistance from the Station Statistician.

Dates of Establishment and Completion

The study will be started in early June, 1963, and an establishment report will be prepared for each stage of the study. A progress report will follow the completion of the first phase of the study. A final report will be prepared when the study is terminated in the fall of 1963.

Cooperation

The Kisatchie National Forest will provide study plots in logging areas. Newport Industries, Oakdale, Louisiana, will provide turpentine and alpha-pinene for the tests.

Costs

Salaries and per diem	$1,000.00
Vehicle expense	200.00
Insecticides, chemicals, and equipment	75.00
Total	$1,275.00

Literature Cited

1. Chararas, C., 1959. L'attractivite exercee par les coniferes a legard de Scoltides et le role des substances terpeniques extraites des oleoresins. Rev. Pathol. Veg. et Entomol. Agric. France 38(2):113:129.

2. Chararas, C., and A. Berton, 1961. Nouvelle methods d'analyse des exhalaisons terpeniques de Pinus maritima et comportement de Blastophagus piniperda (Col. Scolytedae). Rev. Pathol. Veg. et Entomol. Agric. France 40(4):235-243.

3. Hopkins, A.D., 1899. Report on investigations to determine the cause of unhealthy conditions of the spruce and pine, 1880-1893. W. Va. Agr. Expt. Sta. Bul. 56.

4. Yasunaga, Kunisuke, 1962. Studies on attractants of the pine bark beetles, Part II. Field tests on the attractability of benzoic acid. J. Jap. For. Soc. 44(7):197-200.